



*National Information Exchange Model*

# ***Practical Implementer's Course***



United States  
Department of Justice

## **Exchange Modeling**



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## Overview

- Explain why exchange modeling is an important part of the IEPD process
- Describe various options for exchange modeling and the pros and cons of each
- Define the elements of an exchange model, including
  - Classes and attributes
  - Associations
  - Cardinality
  - Inheritance/specialization
- Understand exchange modeling tools that support open standards, such as Visio and ArgoUML



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## Motivation

- In building an IEP, it is critical to have
  - Precise definition/description of exchange structure
    - Not limited paper documents
  - Description that can be understandable and verifiable by all stakeholders (bridge the communication gap)
  - Description technique that facilitates interactive design



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## Gathering Requirements

MVD-11015  
REV. 04/02

RIO RANCHO DEPT  
OF PUBLIC SAFETY

COUNTY CODE  
2 9

AGENCY CODE  
2 9 3

MICROFILM NUMBER, DO NOT PRINT ABOVE THIS LINE  
1229071 4

STATE OF NEW MEXICO  
UNIFORM TRAFFIC CITATION

IsWarning  
WARNING (W)

Subject  
PLUMMER  
SubjectLastName

Subject  
CATHERINE  
SubjectFirstName

ADDRESS  
2513 MANZANO LOOP NE  
CITY  
RIO RANCHO  
STATE  
NM  
ZIP CODE  
87144

STATE  
NM

DRIVER LICENSE NUMBER  
000000001

DATE OF BIRTH  
03/27

SOCIAL SECURITY NUMBER  
000-00-0000

SEX  
F

HEIGHT  
504

WEIGHT  
100

EYE COLOR  
BLU

LICENSE PLATE NUMBER  
204 MNL

VehicleRegistration

STATE  
NM

VEH YR  
98

COLOR  
TAN

TYPE / MAKE / MODEL  
SUV/JEEP/GRAND CHEROKEE

C M V  
Y N

LICENSE TYPE  
LP D E A B C

HAZMAT PL  
Y N

PASS 16+  
Y N

DOT NUMBER

TRAFFIC  
LT MD HV

WEATHER  
CL FG RN SN DS

ROAD  
D W I S

LIGHT  
LT DS DK

ACCIDENT  
Y N

STATUTE 66-7-301  
SPEEDING

STATUTE 66-5-205  
NO INSURANCE

STATUTE 66-7-372  
NO SEAT BELTS

ORDINANCE  
12-6-1.2

Charge

DATE  
04/03/02

TIME  
08:00

IDENTIFICATION  
1513

DISTRICT

MILE POST





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## **UML—How Much?**

- UML is an extensive specification for modeling
- Most of it is not relevant to modeling exchange document structure
- Focus on “static structure”—class diagrams



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## Classes and Attributes

- **Classes** are found by listening for **nouns** in descriptions of the domain
- Example
  - Police officer issues a citation to a subject on behalf of an agency
  - Each citation documents one or more charges, which refer to statutes
- Each class has characteristics called **attributes**
- Attributes are what define the thing

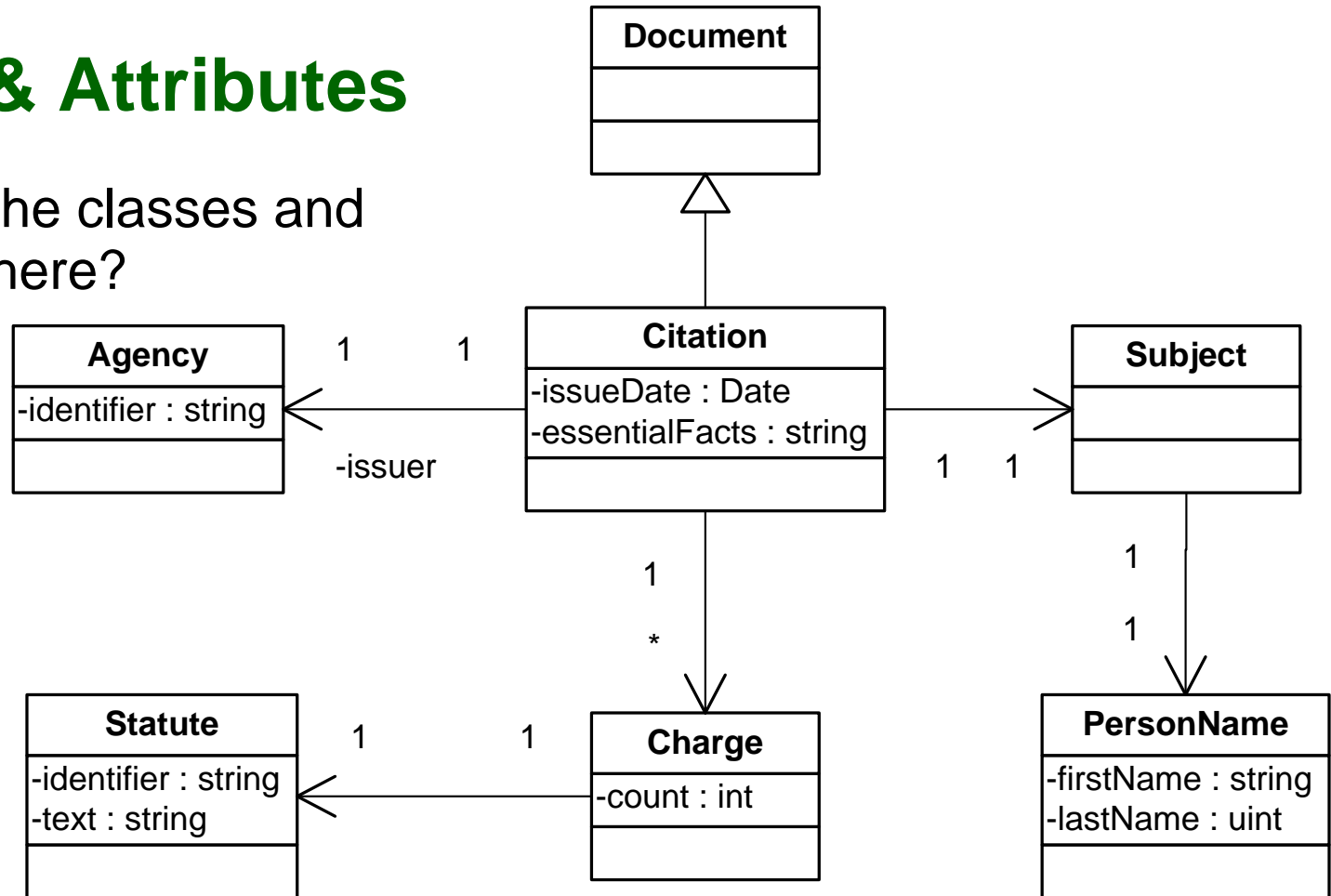


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## Classes & Attributes

- What are the classes and attributes here?





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## Associations (“has a”)

- Describe how classes relate to one another
- Example
  - Police officer issues a citation on behalf of an agency
- Associations can be verbs from exchange or simply descriptions of relationships
- When modeling hierarchical document structures, associations are **navigable** (unidirectional)
- Associations are indicated with open-ended arrows
- Can be named; if not, read as “relates to,” “contains,” or “has”



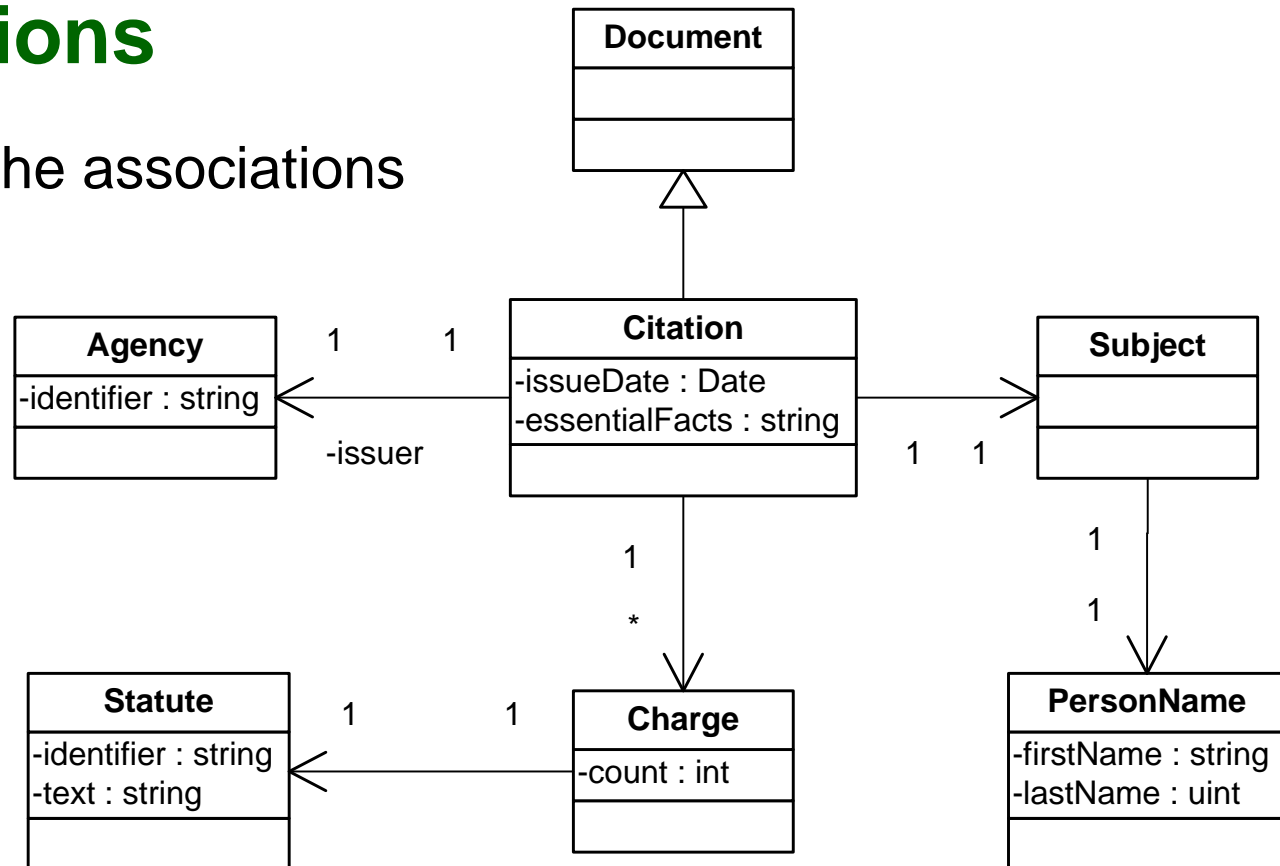


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## Associations

- What are the associations here?





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## Cardinality

- Cardinality documents the quantitative aspects of associations
- How many of one thing relates to how many of another
- Example
  - Police officer issues one citation to one subject
  - Each citation documents one or more charges
- Indicated with lower and upper bound numbers (similar to min/max occurs in XML Schema)

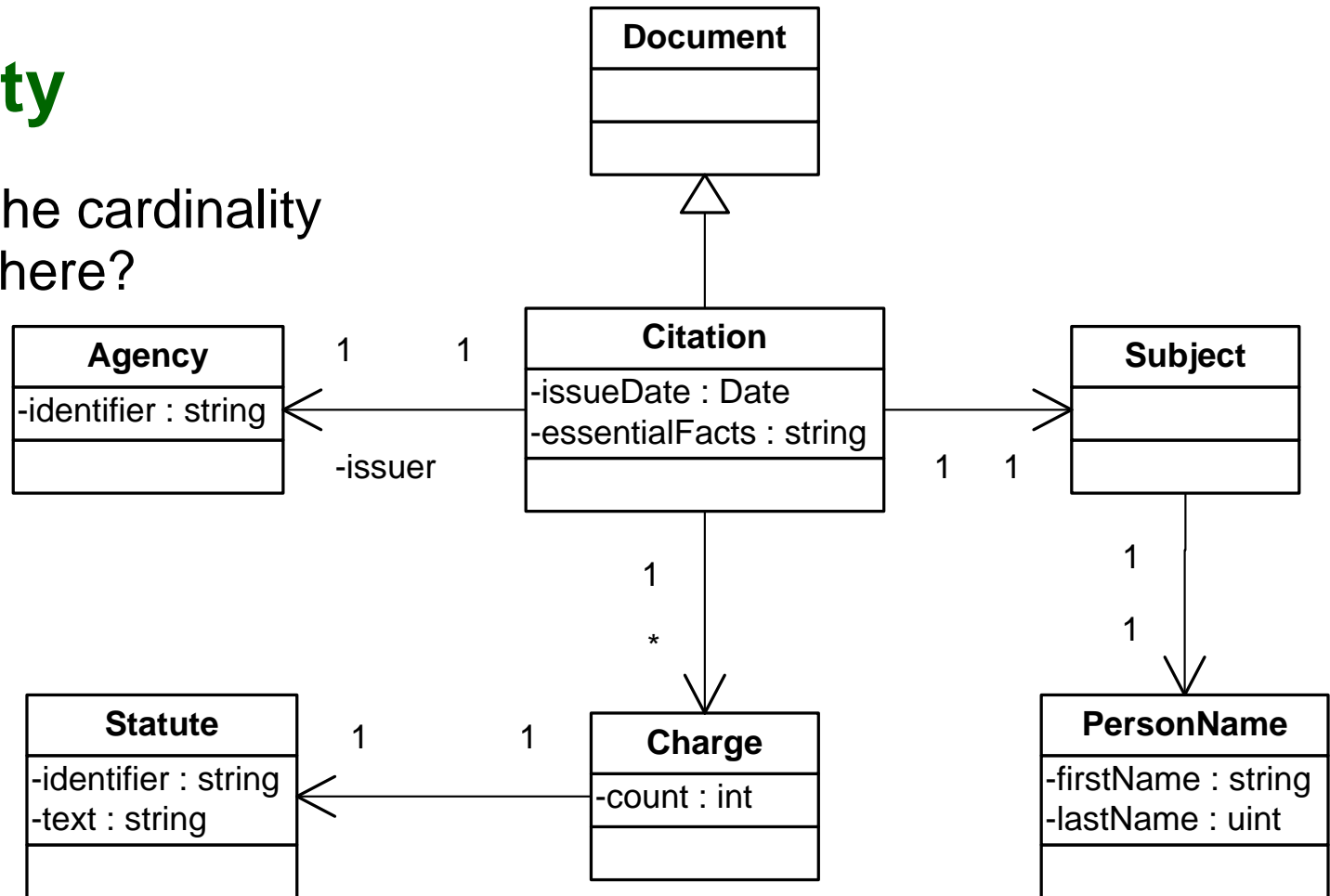


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## Cardinality

- What are the cardinality indicators here?





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## Inheritance

- Inheritance is used to document generalization/specialization relationships
- Should only be used when one thing is truly a special kind of some other thing
- Inheritance is generally over-used
- Important not to confuse with role-played-by relationships or simply shares-attributes-with relationships
- Indicated with closed-end arrow

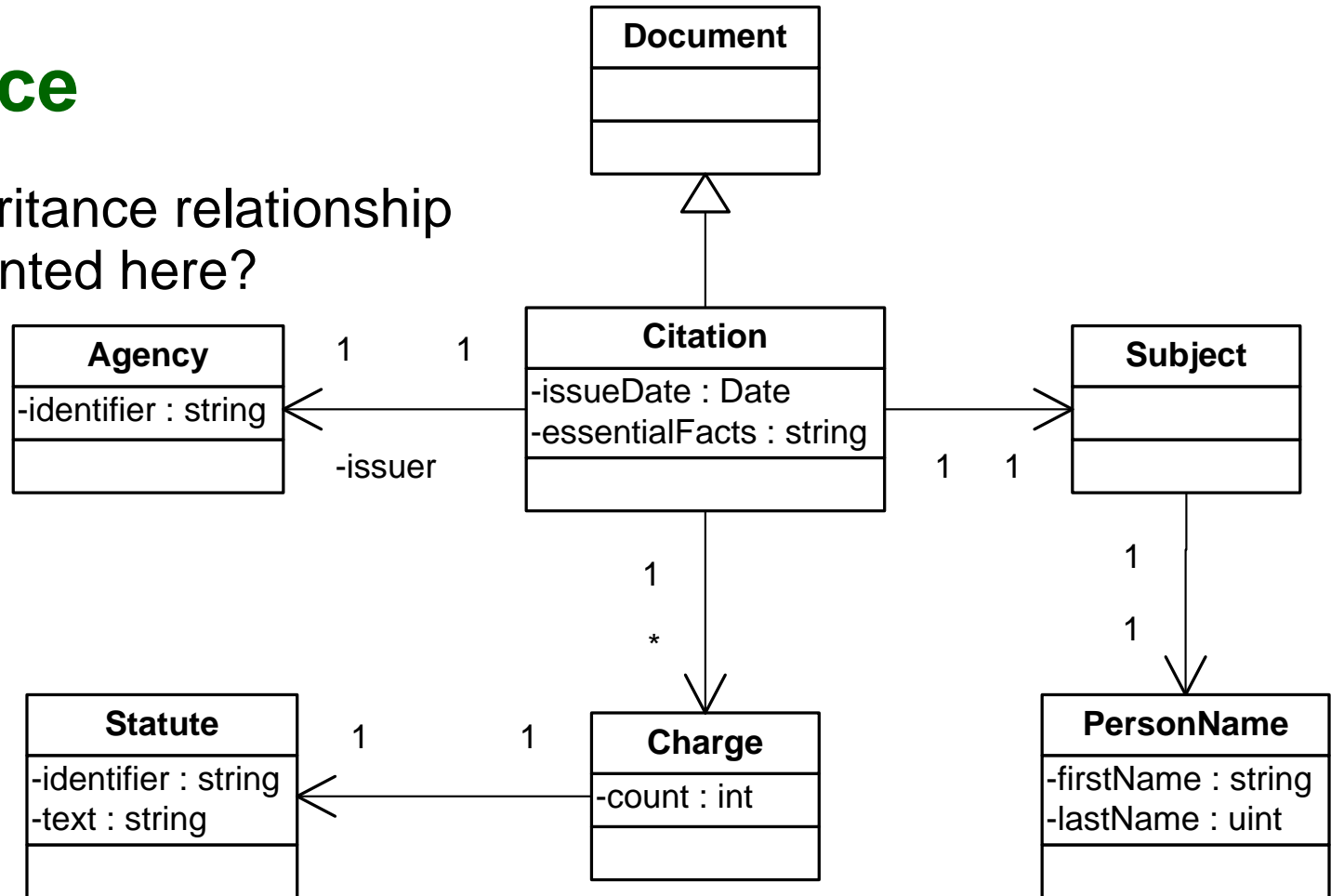


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## Inheritance

- What inheritance relationship is documented here?







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## **More Robust Example**

- AMBER Alert Reference IEP
- Models available for download from the Justice Standards Clearinghouse at <http://niem.gov/iepd/>



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## **Sharing UML Via XMI**

- The IEPD process does not explicitly mention using XMI output
- However, we strongly encourage you to include that as an artifact



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## NIEM as Source of Exchange Concepts

- NIEM contains 600 nouns (complex types)
  - Use these if they fit—do not reinvent the wheel
  - Do not use them if they do not fit—do not restrict your exchange model to what is in NIEM
- Remember—build a model that the business people can understand and agree to



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## Hiring the Right Help

- If you hire a facilitator or tech expert, require
  - Specific process steps in RFPs
  - UML modeling
  - Tools that produce open artifacts
  - Object-oriented domain modeling experience
  - Facilitator or technical expert to provide mentoring
- Support your facilitator/technical experts with the right work group members



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## Semantic Definitions

- In addition to determining a model describing the classes and associations, it is critical to capture the precise semantic meaning of each
  - Class
  - Attribute
  - Association
- Most UML tools have a means of capturing the relevant semantic documentation of each





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## **Exchange Modeling Practical Exercise**



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**Use UML to model the  
following scenario**

**Remember—the NIEM can be a good  
source of domain concepts but should  
not be the only source**



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## Law Enforcement Scenario

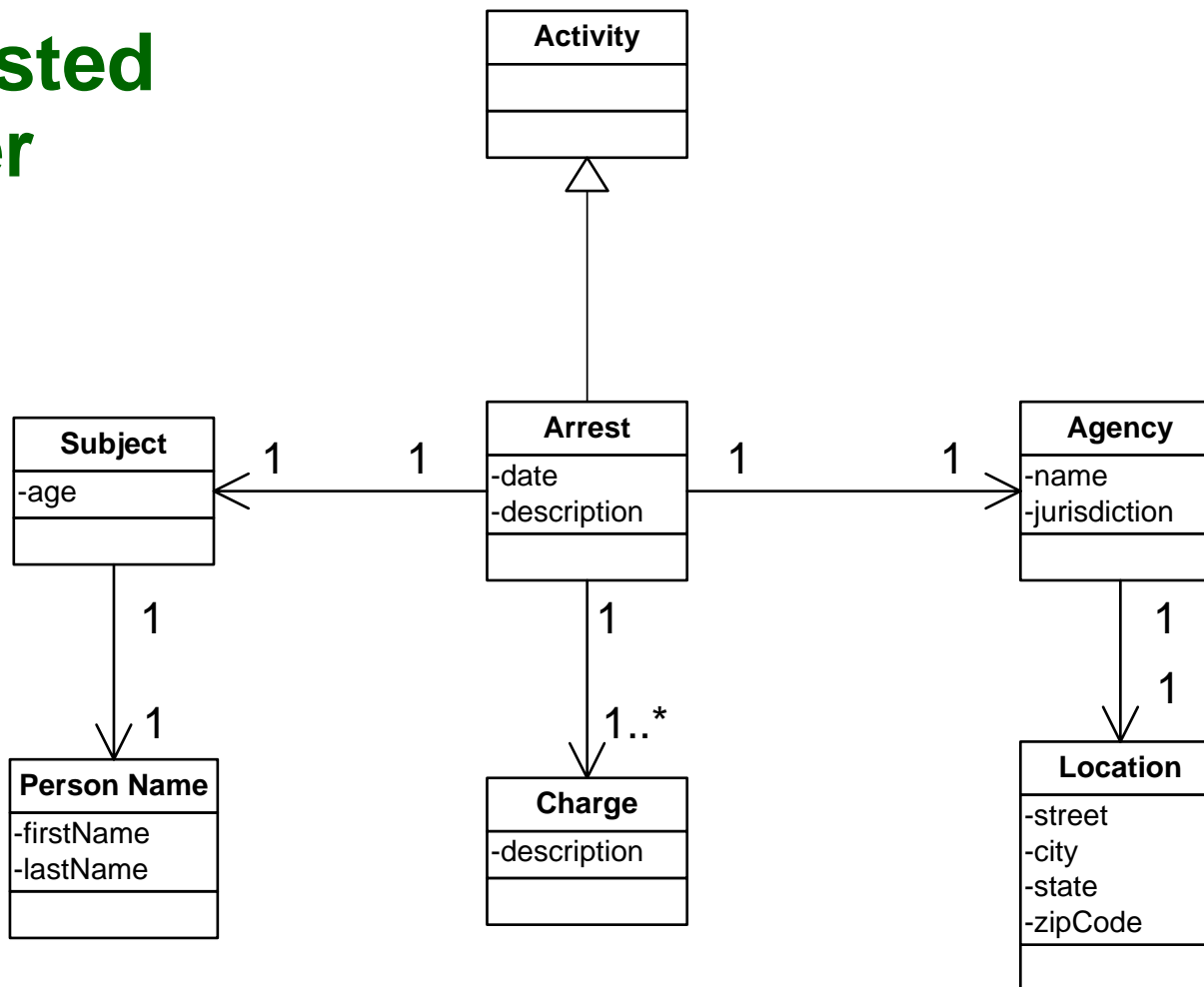
- An arrest
  - Is a specialized type of activity
  - Has a date and description
  - Has one subject associated with it—the subject has a first name, last name, and age
- A law enforcement agency must be associated with each arrest; the agency has a name and jurisdiction
- Agency has a location, including street, city, state, and zip
- Arrest must be associated with one or more charges and each charge needs a description



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## Suggested Answer





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## Courts Scenario

- A warrant
  - Is a specialized type of court order
  - Must have a date requested, date issued, and a description
- There must be an issuing court for each warrant; the court must have a name and jurisdiction
- Court has a location, including street, city, state, and zip
- Warrant must have a subject. The subject has a first name, last name, and age
- Warrant may have several affiants. If so, the affiant has a first name and last name

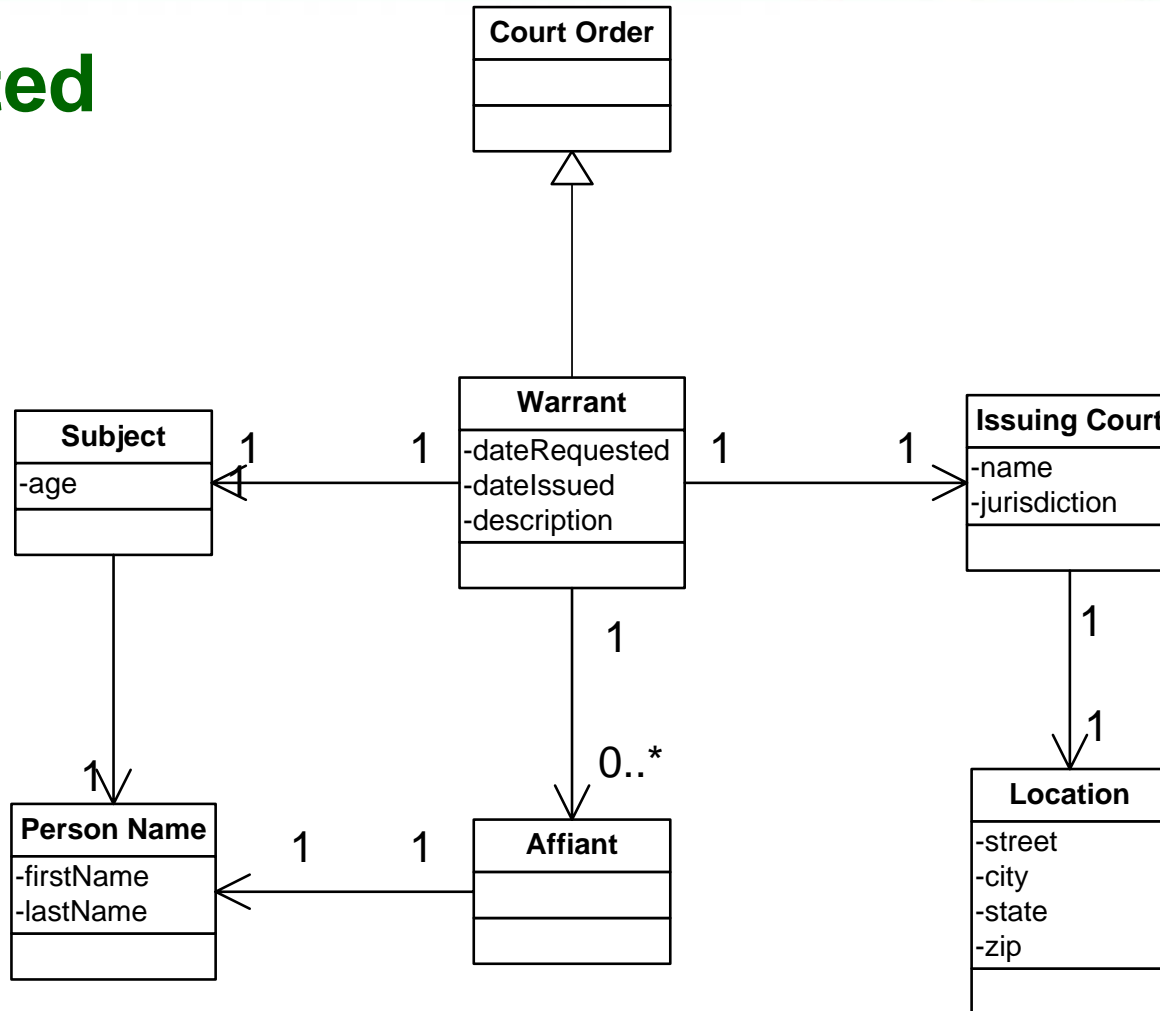




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## Suggested Answer





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## Corrections Scenario

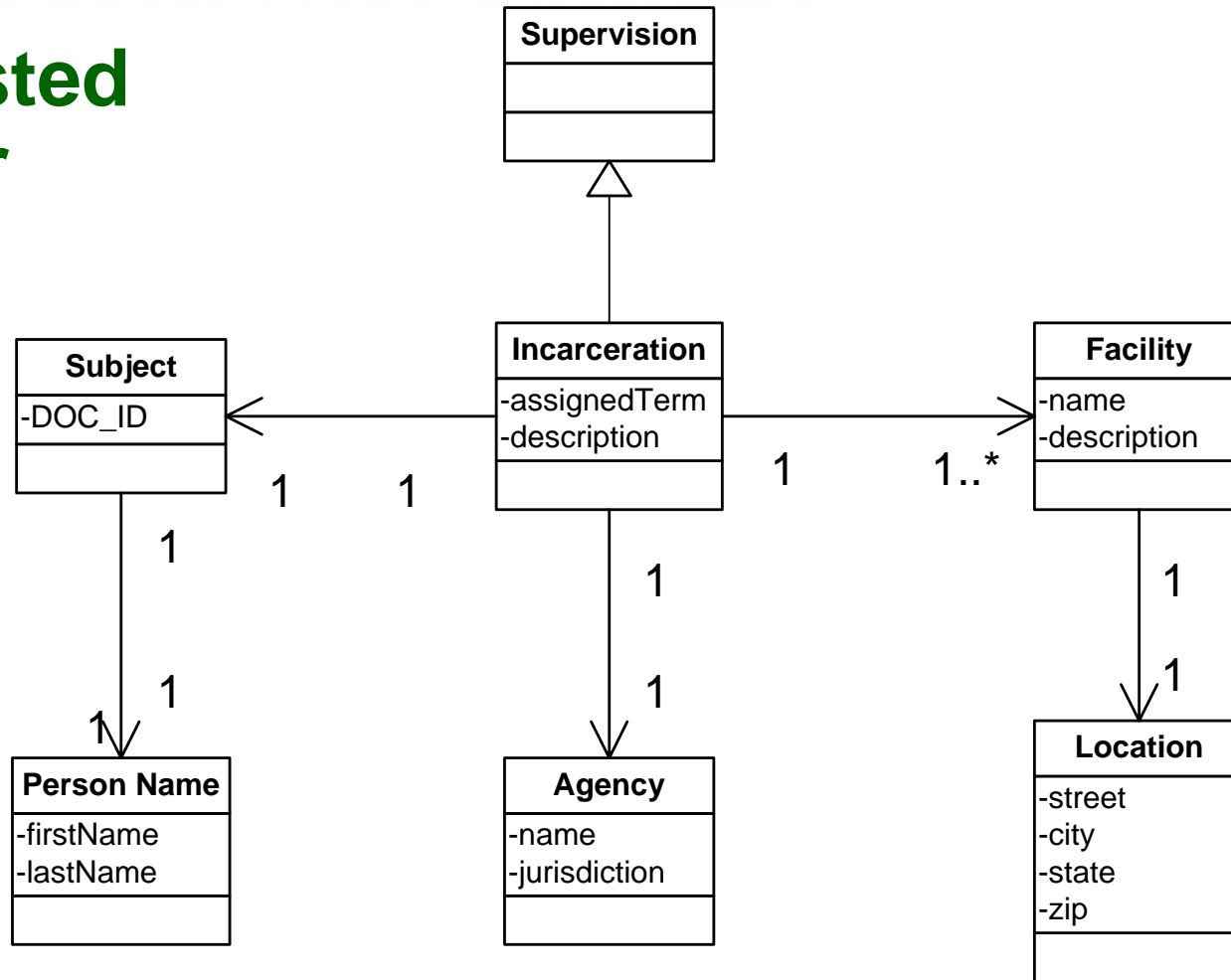
- Incarceration is a specialized type of supervision
- An incarceration
  - Must have an assigned term and description
  - Has a subject—the subject has a first name, last name, and DOC ID number
  - Is associated with one agency—each agency has a name and jurisdiction
  - Is associated with one or more facilities—each facility has a name and description
- The facility has a location, including street, city, state, and zip



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## Suggested Answer





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## Final Thoughts

- Domain modeling is a very useful communication device
- It is not difficult, but experience helps
- Training can help newcomers learn UML and a tool; modeling can only be learned by experience



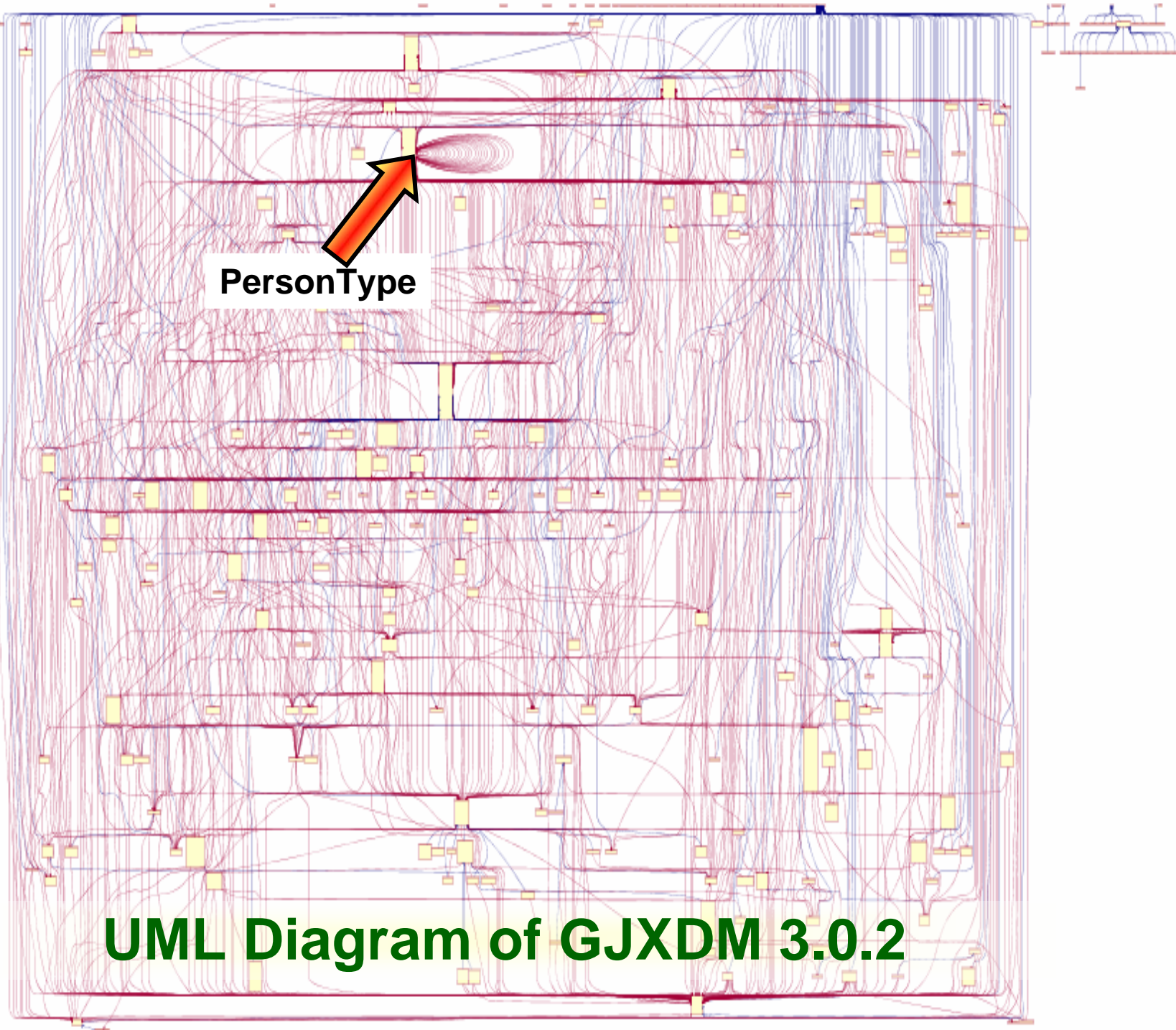
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## UML Resources

- Information Exchange Package Documentation guidelines
- Process Overview white paper (justiceintegration.com, adopted by IJIS XML Advisory Committee)
- *Domain-Driven Design* by Eric Evans
- *UML Distilled* by Martin Fowler
- *Analysis Patterns* by Martin Fowler
- *Modeling XML Applications With UML* by David Carlson
- *Object-Oriented Design Heuristics* by Arthur Riel





**PersonType**

**UML Diagram of GJXDM 3.0.2**



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